

Chapter 1

Background, Purpose of, and Need for the Proposed Action

1.1 INTRODUCTION

At the end of the Cold War, the need for nuclear materials used in weapons in the United States was significantly reduced. Substantial quantities of weapons-usable fissile materials that had previously been intended for use in warheads remain in Department of Energy (DOE) facilities. The President has declared that some quantities of fissile materials are surplus to national defense and defense-related program needs. Other materials are being retained for defense and defense-related program needs. Additional fissile materials may be declared surplus in the future. As a result, DOE is developing an integrated strategy for storage and disposition of weapons-usable fissile materials.

As the number of weapons in the stockpile is reduced, DOE is faced with the challenge of effectively managing weapons-usable fissile materials in existing inventories and those resulting from the dismantlement of nuclear weapons and weapon components. Declaration of fissile materials as surplus by the President is resulting in an inventory of fissile materials that includes all isotopes of plutonium (Pu) except Pu-238 (used in space and industrial applications), uranium-233 (U-233), and highly enriched uranium (HEU), which is uranium with a U-235 isotopic content of 20 percent or more. If not properly managed, these fissile materials could pose a danger to national and international security. DOE must manage the storage and disposition of these materials to prevent the potential for proliferation of nuclear weapons and adverse environmental, safety, and health consequences.

This *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (Storage and Disposition PEIS) analyzes the potential direct, indirect, and cumulative environmental effects of reasonable alternatives for the long-term storage of nonsurplus Pu and HEU, storage of surplus Pu and HEU pending disposition, and disposition of surplus weapons-usable Pu. [Text deleted.] A separate document, *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE/EIS-0240 [HEU EIS]), addresses the disposition of surplus HEU. The HEU EIS Record of Decision (ROD) was published on August 5, 1996 (61 FR 40619).

A key element of DOE's decisionmaking is a thorough understanding of the environmental impacts that may occur during the implementation of the proposed action. The *National Environmental Policy Act* of 1969 (NEPA), as amended, provides Federal agency decisionmakers with a process to consider potential environmental consequences (both positive and negative) of proposed actions before making decisions. In following this process, DOE has prepared this Storage and Disposition Final PEIS to analyze various long-term storage and disposition alternatives and to provide the necessary background, data, and analyses to help decisionmakers and the public understand the potential environmental impacts of each alternative. The results of the environmental analyses, together with information from technical and economic studies, the nonproliferation analysis, and public input, will form the basis for DOE's decisions, which will be discussed in an ROD to be issued no sooner than 30 days after publication of this Storage and Disposition Final PEIS.

1.1.1 WEAPONS-USABLE FISSILE MATERIALS

Locations in the United States. The Department's inventories of Pu and HEU are located at a number of DOE sites, including the Hanford Site (Hanford), Idaho National Engineering Laboratory (INEL), Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), Oak Ridge Reservation (ORR), the Pantex Plant (Pantex), Rocky Flats Environmental Technology Site (RFETS), and Savannah River

Site (SRS). [Text deleted.] The weapons-usable Pu materials are those that can be readily converted for use in nuclear weapons, including weapons-grade, fuel-grade, and power reactor-grade Pu. Inventories and locations of currently declared surplus weapon-grade Pu and surplus HEU, as stated in DOE's Openness Initiative of February 6, 1996, are presented in Figures 1.1.1-1 and 1.1.1-2, respectively. These materials, currently declared excess to national security needs, total approximately 38.2 metric tons (t) (42.1 short tons [tons]) of weapons-grade Pu and 174.3 t (192.1 tons) of HEU. As of September 1994, the total U.S. inventory of Pu is composed of 85 t (93.7 tons) of weapons-grade material,¹ 13.2 t (14.6 tons) of fuel grade, and 1.3 t (1.4 tons) of power reactor grade (DOE 1996p:17). [Text deleted.]

Materials Covered in This Programmatic Environmental Impact Statement. All Pu (except for Pu-238 and Department of Defense [DoD] weapons program materials in use) and nonsurplus HEU (except DoD weapons program materials in use) are being considered for the various long-term storage alternatives. The Pu materials being considered for disposition in this PEIS are those the President has declared surplus or may declare surplus to national defense needs in the future in response to recommendations from the Nuclear Weapons Council (made up of representatives from DOE, DoD, and the Joint Chiefs of Staff). For the purposes of analysis, this PEIS analyzes the disposition of a nominal 50 t (55.1 tons) of Pu. The Pu materials covered in this PEIS are primarily in the form of pits (Pu-bearing weapons components), metals, and oxides.

The Department is currently in the process of stabilizing and repackaging weapons-usable fissile materials and placing them in safe, secure interim storage awaiting decisions on long-term storage and disposition. For Pu, this is being accomplished in accordance with the corrective actions identified in DOE's *Plutonium Vulnerability Management Plan* (DOE/EM-0199). This plan was developed in response to an assessment in DOE's *Plutonium Working Group Report* (DOE/EH-0415) and recommendations by the Defense Nuclear Facilities Safety Board (DNFSB) to improve the schedule for interim safe storage at those sites where Pu is currently stored (DNFSB 94-1). These corrective actions include material packaging upgrades and standardized packaging to facilitate cost-effective management of materials well into the future. This will be the base condition and storage configuration from which decisions will be made on future storage. In addition, the Pu materials will also meet the *Criteria for Safe Storage of Plutonium Metals and Oxides* (DOE-STD-3013-94), a DOE standard for long-term storage (at least 50 years) of these materials. Fissile materials present in spent nuclear fuel or irradiated targets² from reactors are not covered in this PEIS; they are not considered weapons-usable because separation of the relevant isotopes from these highly radioactive materials requires significant remote chemical processing. Any subsequent reprocessing and extraction of Pu from spent fuel is beyond the scope and the fundamental nonproliferation purpose of the program covered by this PEIS.

Following the discontinuance of nuclear weapons material production, large quantities of residues remained as a result of the chemical and thermal processes applied to separate and purify Pu. Examples of residue forms include some impure oxides and metals, halide salts, combustibles, ash, sludges, and contaminated glass. To meet requirements of DOE's *Plutonium Vulnerability Management Plan*, as well as various compliance agreements with State and local regulatory agencies, some Pu residues must be stabilized. As a result of the stabilization process, portions of the residues will potentially be concentrated and stored. These concentrates may be in a form and concentration (greater than 50 percent Pu by weight) that is weapons-usable and are therefore included in this PEIS.³

The stabilization, concentration, and storage of Pu residues, as well as disposal of non-weapons-usable waste, is covered in other existing and future environmental documents as appropriate, including the *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (at SRS) and ROD; the *Plutonium*

¹ Weapons-grade Pu contains less than 7 percent Pu-240, fuel grade Pu contains from 7 to less than 19 percent Pu-240, and power reactor grade Pu contains 19 percent and greater Pu-240.

² These materials are not directly subject to disposition pursuant to this PEIS unless the irradiated fuel or targets were first processed to separate the Pu under another program. Currently, DOE is not proposing such an action.

³ As a result of the stabilization process, there will also be nonweapons-usable Pu or HEU contaminated wastes or residues (less than 50 percent Pu by weight) that would not be within the scope of this PEIS.

Finishing Plant Stabilization Final Environmental Impact Statement (at Hanford) and ROD; the *Environmental Assessment for Solid Residue Treatment, Repackaging, and Storage (at RFETS)* and Finding of No Significant Impact (FONSI); and an EIS on the *Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site* (in preparation), as discussed in Section 1.4. [Text deleted.]

The nonsurplus HEU materials covered in this PEIS are primarily in the form of metals and oxides. These materials include naval nuclear fuel feed stock, strategic reserves, and programmatic materials. Storage of surplus HEU, pending disposition under the HEU EIS and ROD, is also analyzed.⁴ The HEU materials for long-term storage will meet long-term storage criteria for safe storage of HEU metals and oxides, which are under development at this time. Appropriate environmental review will be prepared for stabilizing and repackaging the HEU materials to meet respective long-term storage criteria.

1.2 BACKGROUND

The arms race between the superpowers was brought to a close at the end of the Cold War, causing increases in stockpiles of surplus weapons-usable fissile materials. Continued implementation of arms reduction agreements may lead to additional quantities being declared surplus in the future. With the collapse of the Soviet Union and the economic and social challenges faced by newly formed states, there is a serious risk of nuclear proliferation from those growing stockpiles. The United States has taken steps to address this risk of nuclear proliferation. In September 1993, President Clinton announced the *Nonproliferation and Export Control Policy* (see Appendix A), which included the commitment that the United States will do the following:

- Seek to eliminate, where possible, the accumulation of stockpiles of HEU or Pu, and to ensure that, where these materials already exist, they are subject to the highest standards of safety, security, and international accountability.
- Initiate a comprehensive review of long-term options for Pu disposition, taking into account technical, nonproliferation, environmental, budgetary, and economic considerations. Russia and other nations with relevant interests and experience will be invited to participate in the study.

Following the President's policy announcement, the National Security Council, together with the White House Office of Science & Technology Policy, established an Interagency Working Group (IWG) to initiate a comprehensive review of the options for disposition of surplus Pu from nuclear weapons activities. Members of the IWG include the Arms Control and Disarmament Agency, Environmental Protection Agency (EPA), DNFSB, Nuclear Regulatory Commission (NRC), Office of Management and Budget, DOE, Department of State, and DoD. DOE has the lead role within the IWG for evaluating technical options and conducting economic, schedule, and environmental analyses.

At the Moscow Summit in January 1994, President Clinton and President Yeltsin issued the *Joint Statement by the President of the Russian Federation and the President of the United States of America on Non-Proliferation of Weapons of Mass Destruction and the Means of Their Delivery* (see Appendix A). The two Presidents agreed to task their technical experts to study options for the disposition of weapons-usable fissile materials, including Pu, taking into account the issues of nonproliferation, environmental protection, safety, and technical and economic factors. Under the leadership of the IWG, an initial meeting was held in Moscow in May 1994 to establish the framework for this effort. DOE and its national laboratories have assumed the lead technical role in supporting this joint effort.

⁴This Storage and Disposition PEIS covers long-term storage of nonsurplus HEU and storage of surplus HEU pending disposition. Until storage decisions are implemented, surplus HEU that has not gone to disposition will continue to be stored pursuant to, and not to exceed the 10-year interim storage time period evaluated in the *Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee* (DOE/EA-0929, September 1994) and Finding of No Significant Impact. [Text deleted.]

At the end of January 1995, specialists from the United States and Russia met at LANL for a 2-day exchange of technical presentations on scientific research that had been conducted on potential Pu disposition alternatives and on promising prospective investigations. During this meeting, the United States and Russia reviewed various long-term storage and disposition options. Both sides agreed to conduct consistent comparisons of alternatives for the disposition of Pu, taking into account the factors noted in the Summit statement of the two Presidents.

In addition, DOE sponsored a National Academy of Sciences (NAS) study on the management and disposition of surplus weapons Pu. In its report, *Management and Disposition of Excess Weapons Plutonium* of March 1994, the NAS stated that the existence of surplus weapons-usable fissile materials was a "clear and present danger to national and international security" and then identified proposed standards for managing the risks associated with surplus weapons-usable fissile materials (NAS 1994a:vii,31-34). The following standards, although not regulatory requirements, were identified by the NAS and modified by DOE:

- *The Stored Weapons Standard.* The high standards of security and accounting for the storage of intact nuclear weapons should be maintained, to the extent practical, for weapons-usable fissile materials throughout dismantlement, storage, and disposition. [Text deleted.]
- *The Spent Fuel Standard.* The surplus weapons-usable Pu should be made as inaccessible and unattractive for weapons use as the much larger and growing quantity of Pu that exists in spent nuclear fuel from commercial power reactors.

The NAS also identified several disposition options that meet these standards, including immobilization of Pu for disposal and the use of Pu in mixed oxide (MOX) fuel for commercial (non-defense) nuclear reactors. Material forms resulting from the immobilization and reactor options would be disposed of in a high-level waste (HLW) repository. The NAS also identified the deep borehole as a possible disposition option, where ultimate disposal is accomplished by emplacing the Pu material several kilometers below the water table into ancient, geologically stable rock formations. DOE used the NAS report as the starting point for developing the proposed action for disposition of surplus Pu.

More recently, through the ongoing efforts of the joint U.S./Russia study, the *Joint United States/Russian Plutonium Disposition Study* on technical options for the disposition of surplus Pu was issued in late September 1996. This study was undertaken to provide a consistent comparison of deep borehole, immobilization, and reactor alternatives by the two countries using criteria related to nuclear nonproliferation, safety, environmental protection, and technical and economic factors. Joint technical demonstrations are planned by the United States and Russia to support implementation of disposition decisions. The study and options will provide decisionmakers from both countries with a set of jointly evaluated alternatives for Pu disposition and help build further trust and cooperation in the area of fissile materials disposition.

1.3 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The Department proposes to take the following actions for U.S. weapons-usable fissile materials:

- **Storage**—provide a long-term storage system (for up to 50 years) for nonsurplus Pu and HEU that meets the Stored Weapons Standard and applicable environmental, safety, and health standards while reducing storage and infrastructure⁵ costs
- **Storage Pending Disposition**—provide storage that meets the Stored Weapons Standard for inventories of weapons-usable Pu and HEU that have been or may be declared surplus

⁵ Includes electrical power, fuel, transportation network requirements, and safeguards/security.

- Disposition—convert surplus Pu and Pu that may be declared surplus in the future to forms that meet the Spent Fuel Standard, thereby providing evidence of irreversible disarmament and setting a model for proliferation resistance

[Text deleted.]

The purpose of the proposed action is to implement the President's *Nonproliferation and Export Control Policy* in a safe, reliable, cost-effective, and timely manner. DOE is proposing a comprehensive program to accomplish this purpose by providing an exemplary long-term storage system for weapons-usable fissile materials, eliminating the stockpile of surplus weapons-usable Pu, and establishing the technical and program infrastructure that will enable the United States to dispose of surplus weapons-usable Pu.

A portion of the materials covered in this Storage and Disposition Final PEIS may be subject to international and/or bilateral inspection. Consistent with the President's *Nonproliferation and Export Control Policy*, surplus fissile materials will be subject to international inspections, including inspections by the International Atomic Energy Agency (IAEA), with the imperative that there would be no disclosure of sensitive/classified information to unauthorized parties. Furthermore, in an effort to increase transparency between the United States and Russia on nuclear disarmament, some nonsurplus materials may be made available for bilateral inspections with the Russians, once an agreement is reached between the two countries. Facilities for long-term storage and disposition would be designed or modified, as needed, to accommodate inspection requirements. Other modifications to those facility designs might be needed should new treaties come into effect.

In March 1995, the President declared 200 t (220 tons) of fissile materials to be surplus to national defense needs. These materials are in various compositions and forms. A long-term storage plan is needed to provide continued and adequate control of these surplus materials and any that may be declared surplus in the future, from now through disposition. Disposition of surplus Pu is needed to reduce the reliance on institutional controls and to provide visible evidence of irreversible disarmament. A comprehensive long-term storage and disposition action is needed to ensure that weapons-usable fissile materials are properly managed and to prevent the increase of potential environmental, health, and safety risks. This includes achieving nonproliferation goals through the disposition of surplus Pu, providing long-term storage for nonsurplus Pu and HEU, and providing storage for surplus Pu and HEU that cannot go directly from current storage to disposition. DOE also recognizes the need to strengthen national and international arms control efforts by providing a storage and disposition model for the international community. This action will enhance U.S. credibility and flexibility in negotiations on bilateral or multilateral reductions of surplus weapons-usable fissile materials inventories.

1.4 RELATED NATIONAL ENVIRONMENTAL POLICY ACT REVIEWS

Weapons-usable fissile materials are divided into two categories—surplus and nonsurplus. The nonsurplus category includes naval nuclear fuel, strategic reserves, programmatic materials (non-weapons research and development [R&D], weapons R&D, and other programmatic materials), and weapons program materials in use (as shown in Figure 1.4–1). Weapons program materials in use will not go into long-term storage. These materials are primarily located in weapons and operational storage vaults at current DoD weapons complex sites. For this reason, these materials are not analyzed for long-term storage. The ongoing and completed environmental reviews related to the storage and disposition of weapons-usable fissile materials, both Pu and HEU, are summarized in Table 1.4–1. A description of these and other related environmental reviews is given below.

Current or Interim Storage. The *Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (Pantex EIS, DOE/EIS-0225, November 1996), is a sitewide EIS that covers current and proposed facilities and activities at Pantex in Amarillo, Texas, where Pu pits are currently stored. The Pantex EIS analyzes the alternatives and environmental impacts associated with conducting nuclear weapons operations at Pantex for approximately 10 years. Included in the

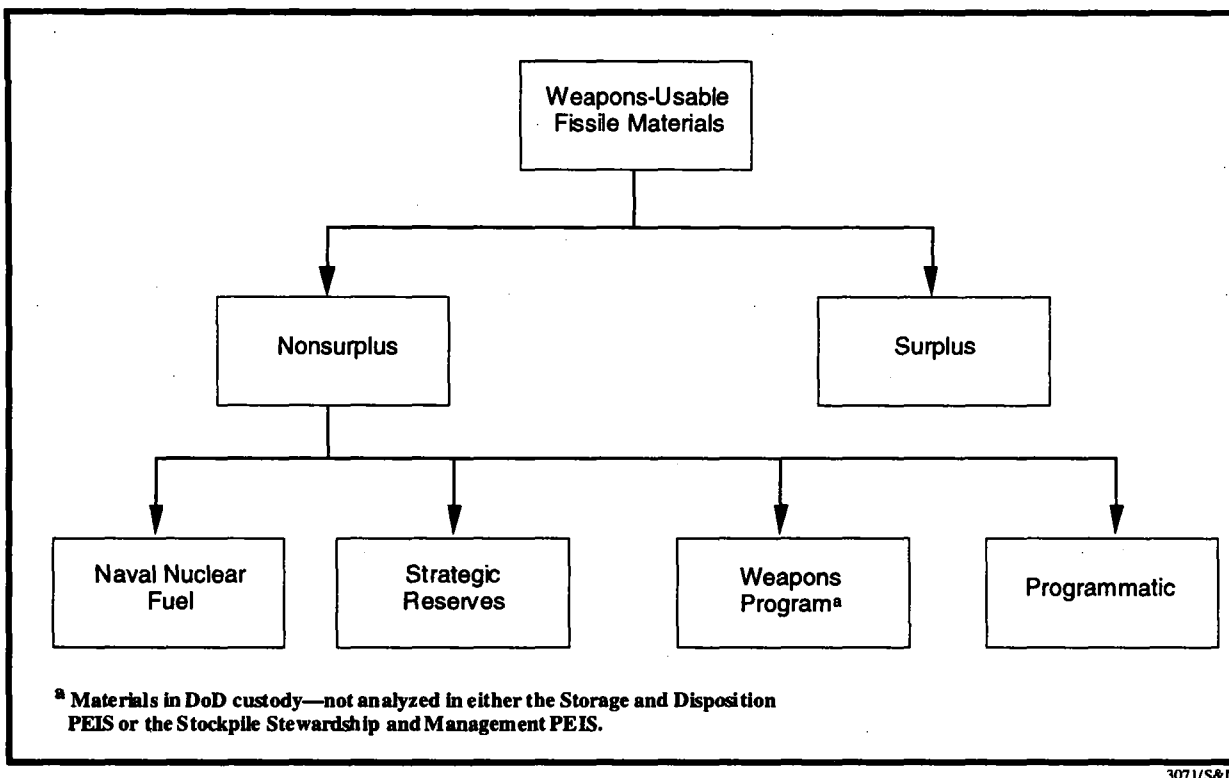


Figure 1.4-1. Weapons-Usable Fissile Material Categories.

Pantex EIS is an analysis to increase the interim storage of Pu pits from 12,000 pits to 20,000 pits. The Pantex EIS also analyzes alternate locations to Pantex for interim pit storage operations.

In May 1994, when DOE announced its intention to prepare the Pantex EIS, DOE believed that the Pantex EIS ROD would precede decisionmaking on the long-term storage of pits. Accordingly, the Pantex EIS was scoped to address alternate locations for interim pit storage (that is, until the long-term decisions are made and implemented).

The *Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee (Y-12 EA)* (DOE/EA-0929) evaluates the continued receipt, prestorage processing, and interim storage of enriched uranium for up to 10 years in quantities that would exceed the historical maximum storage level. The Y-12 EA was issued in September 1994 and was followed by a FONSI in September 1995. In the FONSI, DOE determined that the Y-12 Plant (Y-12) would store no more than 500 t (550 tons) of HEU and no more than 6 t (6.6 tons) of low-enriched uranium (LEU).

The *Interim Storage of Plutonium at the Rocky Flats Environmental Technology Site Environmental Impact Statement*, announced for preparation by DOE on July 17, 1996 (61 FR 37247), will evaluate reasonable alternatives for the safe interim storage of Pu at RFETS, including current and additional inventory from future processing of Pu residues into more stable forms, pending implementation of upcoming long-term storage and disposition decisions, and waste management decisions.

The *Environmental Assessment for Solid Residue Treatment, Repackaging, and Storage* (DOE/EA-1120, April 1996) describes and analyzes the environmental effects of the proposed action to treat, repackage, and provide interim storage of solid residues at RFETS. It also analyzes the alternatives of taking no action, shipping the

Table 1.4-1. Environmental Reviews for Storage and Disposition of Weapons-Usable Fissile Materials

Action	Pu	HEU
Current/Interim Storage	Pantex EIS ^a and other site-specific NEPA documents (see Table 1.4-2)	Y-12 EA ^b
Long-Term Storage	Storage and Disposition PEIS Stockpile Stewardship and Management PEIS ^c	Storage and Disposition PEIS Stockpile Stewardship and Management PEIS ^c
Disposition	Storage and Disposition PEIS	HEU EIS ^d

[Text deleted.]

^a *Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE/EIS-0225, November 1996).

^b *Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee* (DOE/EA-0929, September 1994).

^c *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE/EIS-0236, September 1996).

[Text deleted.]

^d *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE/EIS-0240, June 1996).

residues offsite for treatment, and shipping the residues offsite for storage. A FONSI to the environmental assessment (EA) was signed by DOE in April 1996.

On November 19, 1996, DOE announced its intention to prepare an EIS on the *Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site* (61 FR 58866). This EIS will evaluate the potential environmental impacts associated with reasonable management alternatives for certain Pu residues and all scrub alloy currently being stored at RFETS. The management alternatives include treatment of these materials to enable them to be disposed of as waste or, in the case of separated surplus weapons-usable Pu, stored and dispositioned in accordance to the decisions to be made in the Storage and Disposition PEIS ROD. Activities analyzed in this EIS would be in addition to certain activities evaluated in the *Environmental Assessment for Solid Residue Treatment, Repackaging, and Storage*, previously described, in which a portion of the residues would undergo further treatment prior to waste disposal or other disposition.

Long-Term Storage. With the exception of those materials in weapons programs, the Storage and Disposition PEIS analyzes the environmental impacts of reasonable alternatives for long-term storage of various materials in all categories shown in Figure 1.4-1, including the long-term storage of all Pu pits (strategic reserves and surplus) and the approach for dispositioning pits that are surplus to national security requirements.

Another DOE NEPA document that addresses the storage of pits is the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (Stockpile Stewardship and Management PEIS, DOE/EIS-0236, September 1996). The Stockpile Stewardship and Management PEIS supports decisions on the long-term storage of pits that will be needed for national security requirements (strategic reserve pits). The Preferred Alternative for strategic reserve storage is as follows: (1) HEU strategic reserve storage at Y-12 and (2) Pu pits strategic reserve storage in Zone 12 at Pantex. It also calls for the weapons R&D material (Pu-242), to be stabilized at SRS as a result of the ROD for the *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE/EIS-0220, October 1995), to be transported to LANL for storage.

Table 1.4-2. Additional Environmental Reviews Related to the Storage and Disposition Programmatic Environmental Impact Statement

Site	Document	Status
Argonne National Laboratory-West, Idaho Falls, ID	Electrometallurgical Treatment Research and Demonstration Project in the Fuel Conditioning Facility at ANL-West EA	Final 5/96
Hanford Site, Richland, WA	Plutonium Finishing Plant Stabilization EIS	Final 5/96
Los Alamos National Laboratory, Los Alamos, NM	Los Alamos National Laboratory Site-Wide EIS	In preparation
Multiple DOE sites	Waste Management PEIS	Draft 8/95 Final in preparation
Nevada Test Site, Mercury, NV	Nevada Test Site and Off-Site Locations in the State of Nevada EIS	Final 8/96
Rocky Flats Environmental Technology Site, Golden, CO	Interim Storage of Plutonium at the Rocky Flats Environmental Technology Site EIS	In Preparation
Rocky Flats Environmental Technology Site, Golden, CO	Solid Residue Treatment, Repackaging, and Storage EA	Final 4/96
Rocky Flats Environmental Technology Site, Golden, CO	Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site EIS	In preparation
Savannah River Site, Aiken, SC	Defense Waste Processing Facility, Supplemental EIS	Final 11/94
Savannah River Site, Aiken, SC	F-Canyon Plutonium Solutions EIS	Final 12/94
Savannah River Site, Aiken, SC	Savannah River Site Waste Management EIS	Final 7/95
Savannah River Site, Aiken, SC	Interim Management of Nuclear Materials EIS	Final 10/95
Savannah River Site, Aiken, SC	Tritium Supply and Recycling PEIS	Final 10/95

Since the Stockpile Stewardship and Management Program may store strategic materials and weapons R&D material, this Storage and Disposition Final PEIS separately analyzes, as a subpart of each alternative, the long-term storage of weapons-usable fissile materials without strategic reserves and weapons R&D material (under the programmatic category in Figure 1.4-1). Preparation of this Storage and Disposition Final PEIS and the Stockpile Stewardship and Management PEIS has been closely coordinated to ensure that all necessary information is available to the decisionmaker. Both of these PEISs have progressed to the point where they are scheduled to have their RODs issued in late 1996 or early 1997. Decisions on the long-term storage of pits would be made in the RODs of the PEISs. A decision relating to the interim storage of pits at Pantex would be made in the ROD of the Pantex EIS pending implementation of the selected long-term storage alternative(s).⁶

Disposition. The Storage and Disposition PEIS addresses the disposition of surplus Pu. In the *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (TSR PEIS, DOE/EIS-0161, October 1995), there is an option for a multipurpose reactor that could produce tritium, use Pu in reactor fuel, and generate revenue through the production of electricity. Environmental analysis of the multipurpose reactor

⁶ If there is a delay in implementing the RODs for either of the PEISs (for example, delay due to availability and construction of upgrades for long-term storage facilities), then there would be a need to make a decision on the location of interim storage of pits. The Pantex EIS has been completed with the analysis of interim storage alternatives, including the issues and comments received from the public on that EIS, to support a decision relating to the storage of pits until a long-term storage decision is made and implemented.

is included in the TSR PEIS. On December 6, 1995, the Secretary of Energy made the decision that the future source of tritium would either be from a purchased reactor, from irradiation in a commercial reactor, or from the accelerator production of tritium. The multipurpose reactor was preserved as an option for future consideration. Therefore, the multipurpose reactor, as well as the Fast Flux Test Facility (FFTF) at Hanford, are discussed in Appendix N of this Storage and Disposition Final PEIS.

For the disposition of surplus HEU, DOE's decision, as identified in the HEU EIS ROD, is to gradually blend down a nominal 200 t (220 tons) of HEU⁷ to LEU, containing less than 20 percent of the U-235 isotope, with the potential use of up to 85 percent of the resulting LEU as non-defense reactor fuel feed. The remaining LEU produced by blend-down would be disposed of as low-level waste (LLW). The blending down of the HEU will occur over an estimated 15- to 20-year period, with continued storage of the HEU until blend-down. The proposed action was analyzed separately in the HEU EIS from that of the Storage and Disposition PEIS because the disposition of surplus HEU can be accomplished at existing facilities and with existing technologies, and would involve different alternatives, timeframes, technologies, facilities, and personnel than those required for Pu disposition. The surplus HEU is part of the larger HEU inventory that was analyzed for interim storage in the Y-12 EA. [Text deleted.]

Other Related Environmental Reviews. The *Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (Waste Management PEIS, DOE/EIS-0200D, August 1995) addresses management of the current and 20-year projected inventories of five types of waste (high-level, transuranic, low-level, low-level mixed, and hazardous waste) on a national basis. Among other things, it identifies impacts of consolidating or not consolidating waste management operations across sites where DOE manages wastes. [Text deleted.]

Waste management assumptions in this Storage and Disposition PEIS are based on current practice. These practices may be changed by the waste-type specific RODs from the Waste Management PEIS. However, none of the alternatives analyzed in this PEIS are expected to result in waste forms or produce "end product" materials that are not covered in the Waste Management PEIS.

Additional site-specific environmental reviews are currently being prepared by DOE. A listing of these reviews is included in Table 1.4-2. In particular, the site-specific, sitewide EISs being prepared cover continued operations for some of the sites evaluated in this Storage and Disposition PEIS. Some of the existing activities covered by these EISs are also similar to those of the No Action Alternative analyzed in this Storage and Disposition PEIS. Although the near-term analytical periods for these sitewide EIS analyses may be different from that of this Storage and Disposition PEIS, which is focused on longer-term activities, the preparation of these documents has been closely reviewed and coordinated within DOE.

As work on these and other potentially related NEPA documents proceeds, information from such future NEPA documents will be incorporated, as appropriate, in any supplements to, or documents tiered from, this Storage and Disposition Final PEIS.⁸

1.5 DECISIONS TO BE MADE

From March 8 through June 7, 1996, the Storage and Disposition Draft PEIS was circulated for written and oral comments from other Federal government agencies, State and local governments, Native American tribes,

⁷ The nominal 200 t (220 tons) of HEU addressed in the HEU EIS consists of HEU already declared surplus, plus HEU that may be declared surplus in the future. This is different from and should not be confused with the 200 t (220 tons) of fissile material currently declared surplus by the President, which includes both HEU and Pu.

⁸ The other ongoing or completed NEPA reviews referenced in Section 1.4 of this PEIS involve different purposes, needs, and alternative actions. They also involve, in whole or in part, different workers, locations, affected environments, and timing. As such, this PEIS is independently justified, and can and should proceed regardless of actions taken pursuant to other NEPA reviews. Except for tiered NEPA reviews, the decisions pursuant to this PEIS will not automatically trigger other actions requiring NEPA review.

special interest groups, and the public. Public meetings in the vicinity of the sites under consideration for the proposed action and in Washington, DC were held during the comment period. The comments received, along with DOE's responses, became a part of this Storage and Disposition Final PEIS. The Department also made available the results of the technical, cost, and schedule analyses^{9,10} in July and November 1996, (DOE 1996o:ES-1-ES-14; DOE 1996r: ES-1-ES-8) and the nonproliferation analysis¹¹ in October 1996. Taken together, these analyses will support a formal ROD regarding Pu and HEU storage and Pu disposition. [Text deleted.] These decisions are as follows:

For storage:

- The strategy for long-term storage of nonsurplus weapons-usable Pu and nonsurplus HEU
- The strategy for storage of surplus Pu and surplus HEU until disposition
- The storage site(s) and (if appropriate) facilities

For disposition:

- The strategy and technologies for disposition of surplus weapons-usable Pu

The Department, with interagency coordination, will then issue the ROD. Following the ROD, subsequent tiered and project-specific NEPA documents will be prepared. The tiered NEPA reviews will analyze alternative locations for disposition activities.

1.6 PREFERRED ALTERNATIVE

STORAGE

The Department's Preferred Alternative for storage is to reduce, over time, the number of locations where the various forms of Pu are stored, through a combination of storage alternatives in conjunction with a combination of disposition alternatives. DOE would begin implementing this Preferred Alternative by moving surplus Pu from RFETS as soon as possible, transporting the pits to Pantex as early as 1997, and the non-pit Pu materials to SRS beginning in 2002. Over time, DOE would store Pu in upgraded facilities at Pantex and in an expanded, planned new facility at SRS, and store nonsurplus HEU and surplus HEU pending disposition in upgraded and consolidated facilities at ORR. Storage facilities would also be modified, as needed, to accommodate international inspection requirements consistent with the President's *Nonproliferation and Export Control Policy*. Accordingly, DOE's Preferred Alternative for storage would call for the following actions:

- **Phase out storage of all weapons-usable Pu at RFETS beginning in 1997; move pits to Pantex, and non-pit materials to SRS.** At Pantex, DOE would repackage pits from RFETS in Zone 12, then place them in existing storage facilities in Zone 4, pending completion of facility upgrades in Zone 12. At SRS, DOE would expand the planned new Actinide Packaging and Storage Facility (APSF), and move non-pit Pu materials from RFETS, after stabilization at RFETS, to the expanded APSF upon completion. The small number of pits currently at RFETS that are not in shippable form would be placed in a shippable condition in accordance with existing procedures prior to shipment to Pantex. Additionally, some pits and non-pit Pu materials from RFETS could be used at SRS, LANL, and LLNL for tests and demonstrations of aspects of disposition technologies (see Preferred

⁹ *Technical Summary Report for Surplus Weapons-Usable Plutonium Disposition* (DOE/MD-0003, Rev. 1, October 31, 1996).

¹⁰ *Technical Summary Report for Long-Term Storage of Weapons-Usable Fissile Materials* (DOE/MD-0004, Rev. 1, November 1996).

¹¹ *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Plutonium Disposition Alternatives* (Draft, October 1996).

Alternative for disposition as discussed later in this section). All non-pit weapons-usable Pu materials currently stored at RFETS are surplus.

- **Upgrade storage facilities at Zone 12 South (to be completed by 2004) at Pantex to store those pits currently stored at Pantex, and pits from RFETS, pending disposition.** Storage facilities at Zone 4 would continue to be used for these pits prior to completion of the upgrade. This action would place pits at a central location where most pits already reside and where expertise and infrastructure exist to accommodate pit storage.
- **In accordance with the Preferred Alternative in the Stockpile Stewardship and Management PEIS, store Strategic Reserve pits at Pantex in the facilities discussed above. To the extent not reflected above, store Strategic Reserve materials in accordance with the Preferred Alternative in the Stockpile Stewardship and Management PEIS.**
- **Expand the APSF (Upgrade Alternative) at SRS to store those surplus, non-pit Pu materials currently at SRS and surplus non-pit Pu materials from RFETS, pending disposition** (see Preferred Alternative for disposition as discussed later in this section). The APSF would be built by 2001 pursuant to the *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE/EIS-0220) and ROD, and the expansion to accommodate RFETS material would be completed by 2002. The RFETS surplus non-pit Pu materials would be moved to SRS after stabilization is performed at RFETS under corrective actions in response to recommendation 94-1 by the DNFSB, and after completion of the APSF expansion. This action would place non-pit Pu materials in a new storage facility, in a location with existing expertise and Pu handling capabilities, and where potential disposition activities could occur (see Preferred Alternative for disposition as discussed later in this section). Strategic Reserve pits currently located at SRS would be stored in accordance with the Preferred Alternative in the Stockpile Stewardship and Management PEIS. There are no Strategic Reserve non-pit materials currently located at SRS.
- **Continue current storage (No Action) of surplus Pu at Hanford and INEL, pending disposition** (or movement to lag storage¹² at the disposition facilities). This action would allow surplus Pu to remain at the sites with existing expertise and Pu handling capabilities, and where potential disposition activities could occur (see Preferred Alternative for disposition as discussed later in this section). There are no nonsurplus weapons-usable Pu materials currently stored at either site.
- **Continue current storage (No Action) of surplus Pu at LANL, pending disposition** (or movement to lag storage at the disposition facilities). This Pu would be stored in stabilized form with the nonsurplus Pu in the upgraded Nuclear Material Storage Facility pursuant to the No Action Alternative for the site.
- **Take No Action at the Nevada Test Site (NTS).** DOE would not add Pu to sites that do not currently have Pu in storage.
- **Upgrade storage facilities at Y-12 (to be completed by 2004 or earlier) at ORR to store nonsurplus HEU and surplus HEU pending disposition.** Existing storage facilities at Y-12 would be modified to meet natural phenomena requirements, as documented in *Natural Phenomena Upgrade of the Downsized/Consolidated Oak Ridge Uranium/Lithium Plant Facilities* (Y/EN-5080, 1994). Storage facilities would be consolidated and the storage footprint would be reduced as surplus HEU is dispositioned and blended to LEU, pursuant to the HEU EIS. Consistent with the Preferred Alternative in the Stockpile Stewardship and Management PEIS, HEU strategic reserves would be stored at Y-12.

¹² Lag storage is temporary storage at the applicable disposition facility.

DISPOSITION

The Department's Preferred Alternative for the disposition of surplus Pu is to pursue a disposition strategy that allows for immobilization of surplus weapons Pu in glass or ceramic forms and burning of the surplus Pu as MOX fuel in existing reactors. The disposition of the surplus Pu using these technological approaches would depend on the results of future technology development and demonstrations, site-specific environmental analyses, and detailed cost proposals as well as nonproliferation considerations. The results of these efforts and negotiations with Russia and other nations will ultimately determine the timing and extent to which either or both technologies are deployed.¹³

Under this Preferred Alternative, the U.S. policy not to encourage the civil use of Pu and, accordingly, not to itself engage in Pu reprocessing for either nuclear power or nuclear explosive purposes will not change. Although under the Preferred Alternative some Pu may ultimately be burned in existing reactors, every possible means will be pursued to ensure that Federal support for this unique disposition mission does not encourage other civil uses of Pu or Pu reprocessing. The United States, however, will maintain its commitments regarding the use of Pu in civil nuclear programs in Western Europe and Japan.

Proceeding with this strategy would provide increased flexibility to initiate Pu disposition promptly, and help assure disposition efforts could be accomplished in a timely manner. Establishing the means for expeditious Pu disposition would also help provide the basis for an international cooperative effort that can result in reciprocal, irreversible Pu disposition actions by Russia. DOE's preferred disposition strategy signals a strong U.S. commitment to reducing its stockpile of surplus Pu, thereby effectively meeting the purpose of and need for the Proposed Action.

To accomplish the Pu disposition mission, DOE would consider, to the extent practical, new as well as modified existing buildings and facilities for portions of the disposition activities. The PEIS analyzes new facilities for most disposition alternatives to obtain bounding environmental impacts. DOE would analyze and compare existing and new buildings and facilities for the technologies chosen as part of this strategy in subsequent, tiered NEPA review. In addition, all disposition facilities would be designed or modified, as needed, to accommodate international inspection requirements consistent with the President's *Nonproliferation and Export Control Policy*. Accordingly, DOE's Preferred Alternative for Pu disposition involves the following strategy and supporting actions:

- **Immobilize Pu materials using vitrification or ceramic immobilization.** The immobilization technology could be used for processing pure or impure forms of Pu. Vitrification or ceramic immobilization could include the can-in-canister variant, which could utilize the existing HLW and the Defense Waste Processing Facility (DWPF) at SRS, or new facilities at Hanford or SRS. DOE would continue the R&D leading to the demonstration of the can-in-canister variant at the DWPF using surplus Pu.
- **Convert Pu materials into MOX fuel for use in existing reactors.** Pure materials including pits, pure metal, and oxides could be converted without extensive processing into MOX fuel for use in existing commercial reactors. Other, already separated forms of surplus Pu would require additional cleanup (not reprocessing of spent nuclear fuel). The MOX fuel would be used in existing light water reactors (LWRs) with a once-through fuel cycle, with no reprocessing and subsequent reuse of the spent fuel. If partially completed LWRs were to be completed by other parties, they would be considered for this mission. The MOX fuel would be fabricated in a domestic, government-owned facility at a DOE site.

¹³ Through these efforts, the President would be provided the basis and flexibility to initiate disposition efforts either multilaterally or bilaterally through negotiations or unilaterally as an example to Russia and other nations.

The Department would retain using MOX fuel in Canadian Deuterium Uranium (CANDU) reactors in Canada in the event that a multilateral agreement to use CANDU reactors is negotiated among Russia, Canada, and the United States. The DOE would engage in a test and demonstration for CANDU MOX fuel as appropriate and consistent with future cooperative efforts with Russia and Canada.

With regard to the above, for purposes of analysis of an approach involving a combination of both technologies, approximately 70 percent of the surplus Pu was identified to be in forms (metals and other pure forms) suitable for MOX fuel. The actual percentage and timing for disposition of the surplus Pu using either or a combination of both of the technological approaches would depend on the results of international agreements, future technology development and demonstrations, site-specific environmental assessments, and detailed cost proposals to be completed within the next 2 years. The results of these efforts, as well as nonproliferation considerations and negotiations with Russia and other nations, will ultimately determine the timing and extent to which either or both technologies are deployed for disposition of surplus Pu. In the event both technologies are deployed, and because the time required for Pu disposition using reactors would be longer than that for immobilization, it is probable that some surplus Pu would be immobilized initially, prior to completion of reactor irradiation for other surplus Pu. Deployment of this strategy would involve the following supporting actions:

- **Constructing and operating a Pu vitrification or ceramic immobilization facility at either Hanford or SRS.** DOE would analyze alternative locations at these two sites for constructing new or potentially using modified existing buildings in subsequent tiered NEPA review. SRS has existing facilities and infrastructure to support an immobilization mission, and Hanford has existing plans for constructing and operating immobilization facilities for the wastes in Hanford tanks. DOE would not create new infrastructure for immobilizing Pu with HLW or cesium (Cs) at INEL, NTS, ORR, or Pantex.
- **Constructing and operating a Pu conversion facility¹⁴ at either Hanford or SRS.** DOE would collocate the Pu conversion facility with the vitrification or ceramic immobilization facility discussed above. In subsequent, tiered NEPA reviews, DOE would analyze alternative locations at Hanford and SRS, for constructing new or potentially using modified existing buildings.
- **Constructing and operating a pit disassembly/conversion facility¹⁵ at Hanford, INEL, Pantex, or SRS.** DOE would not add Pu to sites that do not currently have Pu in storage. Therefore, two sites analyzed in the PEIS, NTS and ORR, would not be considered further for Pu disposition activities. DOE would analyze alternative locations at Hanford, INEL, Pantex, and SRS for constructing new or potentially using modified existing buildings in subsequent tiered NEPA review. DOE would demonstrate the Advanced Recovery and Integrated Extraction System (ARIES) concept at LANL for pit disassembly/conversion beginning in fiscal year 1997.
- **Constructing and operating a domestic, Government-owned, MOX fuel fabrication facility at Hanford, INEL, Pantex, or SRS.** DOE would not add Pu to sites that do not currently have Pu in storage. Therefore, two sites analyzed in the PEIS, NTS and ORR, would not be considered further for Pu disposition activities. The MOX fuel fabrication facility would serve only the finite mission of fabricating MOX fuel using surplus Pu for the purpose of Pu disposition. DOE would analyze alternative locations at Hanford, INEL, Pantex, and SRS, for constructing new or potentially using modified existing buildings in subsequent tiered NEPA review.

¹⁴ The Pu conversion facility would convert surplus non-pit Pu material (using a wet chemical process) into a metal or oxide form suitable for use at the next facility in the disposition process.

¹⁵ The pit disassembly/conversion facility would disassemble, reshape, and convert surplus Pu pits (using a dry chemical process) into an unclassified metal or oxide form suitable for use at the next facility in the disposition process. In addition, some non-pit Pu material may also be processed in this facility.

Depending upon decisions in the ROD and pursuant to appropriate NEPA review(s), DOE would continue R&D and engage in further testing and demonstrations of Pu disposition technologies which may include: dissolution of small quantities of Pu in both glass and ceramic formulation; experiments with immobilization equipment and systems; fabrication of MOX fuel pellets for demonstrations of reactor irradiation at INEL; mechanical milling and mixing of Pu and feed forms; and testing of shipping and storage containers for certification, in addition to the testing and demonstrations previously described for the can-in-canister immobilization variant and the ARIES. These tests and demonstrations would slightly reduce the quantity of RFETS pit and non-pit materials to be stored at Pantex and SRS, respectively.

The storage and disposition actions proposed for various DOE sites by the Preferred Alternative are summarized in Table 1.6-1.

Table 1.6-1. Storage and Disposition Actions Proposed by the Preferred Alternative

Action	Hanford	NTS	INEL	Pantex	ORR	SRS	RFETS	LANL
Storage								
No Action	X ^a	X ^b	X ^a					X ^a
Upgrade				X ^c	X ^d	X ^e		
Phaseout							X	
Disposition^f								
Pit Disassembly/Conversion	X		X	X		X		
MOX Fuel Fabrication	X		X	X		X		
Pu Conversion	X					X		
Immobilization	X					X		

^a Pending subsequent tiered NEPA decisions for disposition of surplus Pu.

^b NTS does not currently store either Pu or HEU.

^c For storage of those pits currently at Pantex and pits from RFETS.

^d For storage of HEU only.

^e For storage of only those Pu materials currently at SRS and non-pit Pu materials from RFETS.

^f "X" denotes potential sites for locating the disposition facilities pending subsequent tiered NEPA decisions. Only one of each facility is needed for accomplishing the disposition mission.

1.7 SCOPE OF THE PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Public Scoping Process. During 1994, DOE conducted a phased scoping process to solicit comments on long-term storage and disposition of weapons-usable fissile materials. The initial phase of the scoping process consisted of a series of planning meetings attended by technical experts from DOE's National Laboratories, industry, and academia. These planning meetings helped introduce the objectives of the Fissile Materials Disposition Program to the public and to identify DOE and IWG's roles in implementing the President's *Nonproliferation and Export Control Policy*.

On May 4 and 5, 1994, DOE conducted the first public meeting in Washington, DC. Using the 1994 NAS study as a starting point, the public meeting served as a forum to solicit input on the scope of the Notice of Intent (NOI), which was published on June 21, 1994, in the *Federal Register* (59 FR 31985) to inform the public of the preparation of the Storage and Disposition PEIS.

During August, September, and October 1994, 12 workshops were held to solicit public comment on the scope of the program. Figure 1.7-1 shows the locations and dates of these public scoping workshops. Written comments on the scope of the Storage and Disposition PEIS were also requested from the public. The objective of the workshops was four-fold: comply with NEPA requirements; ensure that the PEIS addresses a range of